Title: Exposure Assessment to Air Pollution of Children Living in the High Risk Area of Milazzo – Valle del Mela (Sicily): a Bayesian Kriging Approach.

Authors:

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Background and aim: To estimate the exposure to ambient gaseous air pollutants at individual residential addresses by a Bayesian kriging approach to be used in studying the relationship between lung function and air pollution in asthmatic subjects living in the high risk area of Milazzo – Valle del Mela (Sicily, Italy).

Methods: ISAAC questionnaire was administered to parents of all 2,506 children attending primary schools of the Milazzo – Valle del Mela area. 154 children that scored positives for any asthmatic symptoms were enrolled in a panel study. The study period was from November 2007 to April 2008. Every two weeks respiratory function and bronchial inflammation was assessed, while parents filled in a diary with daily activities, symptoms and drugs taken by the child during follow-up.
Ambient gaseous air pollutants (SO_2, NO_2, BTX) concentrations were measured by passive dosimeters located at 21 sites at each school-yard during the week preceding each examination (weekly averages). Children's residential addresses were geo-referenced and Bayesian kriging was used to obtain an estimate of pollutants concentration at children's home for each week of monitoring. Exposure assessment was completed by time-activity patterns obtained from daily diaries.

Results: A large geographical heterogeneity in air quality was recorded suggesting complex exposure patterns. In some locations we recorded higher levels of sulphur dioxide (with one or more weekly averages over 20 mcg/cm) and some others showed higher level of NO_2 (with an overall weekly average in the study period over 40 mcg/cm). The spatial distribution of SO_2 concentrations showed the typical shape of a point source with a plume effect. The areas at higher exposure are located along the prevalent wind line. For the period 2007-2008, official data confirmed episodes of SO_2 concentration above 100 mcg/cm.

Conclusions: Our findings suggest that Bayesian kriging may provide better estimates than monitoring values alone since it accounts for the spatial heterogeneity of individual-level exposures.